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THE

ATTACK OF ENTRENCHMENTS BY FIELD ARTILLERY.

BY

MAJOR W. KEMMIS, R.A.

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(*The R.A. Institution Gold Medal Prize Essay, 1880.*)

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THE
ATTACK OF ENTRENCHMENTS BY FIELD ARTILLERY.

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(*The R.A. Institution Gold Medal Prize Essay, 1880.*)

"Ex animo operemur et summâ potestate utamur."

In the employment of field artillery the maximum effect may be obtained from the arm, or—due perhaps to clumsy handling or unscientific application—but a fractional part of its power may be utilised. In the latter case it may nevertheless fall out, from some extraneous causes, that the end in view may be obtained; but even so, can we consider the faulty action to be justified? Clearly not, and the probability is that in the improper or imperfect use risk is run, while there is almost certain to be definite loss in *personnel*, *matériel*, time, or labour, and there most assuredly must be in experience towards training for greater future efficiency.

On every ground, therefore, it is an error, under any circumstances, to make other than the most proper application which the arm, as it exists at the time, admits of.

Taking the field artillery of Great Britain, as it now stands, it will be our endeavour to show how it can best be made use of in the attack of field entrenchments, at the same time making such suggestions for improvement as may occur to us.

In doing this it seems advisable to treat the subject first as a question of gunnery and secondly as a question of tactics—tactics of the unit in the first instance and then of the mass.

I.—THE ATTACK OF FIELD ENTRENCHMENTS AS A QUESTION OF GUNNERY.

The main object of the universal use of entrenchments on the field of battle is to obtain cover from the enemy's fire; the latter, under modern conditions, being so effective and therefore so deciding in the fight. To nullify this object is, and ever must be, the province of artillery.

The arm may carry out this its *rôle* by one of three methods—namely, by destroying the shelter, by searching out effectually the cover afforded, or partly by destroying and partly by searching out.

We have, then, to determine which plan it is best to pursue; and, in following it, which is the proper shell[*]—common or shrapnel—to use, as well as the most suitable trajectory and point of burst of that projectile.

Field entrenchments vary much in character and detail, according to their end and the time and means available for their construction. They are usually classed as, (1) hasty entrenchments for artillery, (2) hasty entrenchments for infantry, (3) field works.

It will be necessary for our purpose to take in each class what may be regarded as a typical form and examine the effect of the projectiles fired against it.

For covering guns the entrenchments made use of are either of the nature of epaulment or pit—more frequently the latter. A profile of the approved English gun-pit[†] is given in Fig. 1, and in Fig. 2, one blinded—such as might be constructed in the exposed parts of an entrenched position, time and means permitting.

Hasty cover for the infantry shooting line is provided by shelter trenches or breastworks; the former are sometimes, but not very often, blinded. Figs. 3, and 4, give profiles of English shelter trenches,[‡] Fig. 8, of a breastwork. For protecting infantry supports, a trench, such as that of Fig. 5, or field casemate,[§] as in Fig. 6, is usually made use of. For reserves, if entrenchments are necessary, field redoubts are generally employed; a profile, of common form, for a field work is shown in Fig. 7.

Having selected the particular entrenchments, it is next necessary to determine the distance of the spot from which the projectiles are to be supposed to be fired against them.

The general limits of range for ordinary artillery shell fire in attack are ruled by the considerations that guns should be brought into action within their effective range and not only so but, for decisive effect, at as short effective range as reasonably attainable.

Effective range of modern artillery is not limited by the power of the piece, but by the power of sight and observation of the gunner. Unless the object can be distinguished, it is ordinarily impossible to lay; and without observation of effect, correction, in order to good shooting, cannot be made. The state of the atmosphere, direction of the light, color, &c., will cause the limit of effective range to vary, but it may be set at the outside as 2500 yds.[||]

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[*] Case shot, being a defensive projectile for special occasions, we leave out of question.

[†] "In 1877-8 the Russians preferred fighting their guns on the surface, while the Turks commonly used sunken pits. Nearly all at Cerkovna and elsewhere on the Lom were of this form."—R.E. Prize Essay 1879, by Bt.-Major Fraser, R.E.

[‡] "It may be safely said that the sections used in 1870-1 and 1877-8 were seldom as good, and in no cases simpler or better, than those in our latest text books."—R.E. Prize Essay 1879, by Bt.-Major Fraser, R.E.

[§] "One of the chief lessons of the war of 1870-1 is the use that was made of blindages, or field casemates, for the supports, when exposed to heavy fire and when timber or rails were procurable."—R.E. Prize Essay 1879, by Bt.-Major Fraser, R.E.

[||] The effective ranges laid down for 16-pr. and 9-pr. M.L.R. in the rules approved for the umpire staff at the Aldershot manœuvres 1875, were respectively 2500 and 2000 yds.

The Prussian "Artillery Drill Regulations" state, "An effective artillery fire is not to be expected beyond 2625 yds."

The shortness of range attainable by artillery is governed by the consideration that, as far as may be, guns should not be brought within that distance at which they are likely to suffer very considerable loss, while coming into action, from opposing artillery in position; and, again, that they should, if possible, be outside the destructive zone of the enemy's infantry fire. With respect to the first-named condition, we find it stated,* that "the experience of the war of 1870–1 shows that the advance of guns into action at a mean range of 2000 paces (about 1670 yds.) can almost always be effected without considerable loss. This arises partly from the great mobility of the battery, and partly from the difficulty which the enemy will experience in firing at a long range against a moving object." From the war of 1876–7 we do not learn much in this respect, the Russians usually coming into action against entrenched positions at excessive ranges.† Taking into consideration that the French artillery was not up to the mark in 1870–1, and that since that time there has been nearly universal improvement in *matériel* and at the same time greater attention to practice, we incline to place the limit now at about 1850 yds. With regard to the limit of approach of artillery to hostile unbroken infantry, there is much variety of opinion: after the war of 1870–1 it was commonly fixed at about 1000 yds., since that time the Prussians have laid down that infantry may fire at artillery up to 1320 yds.‡ Due to improvements in small-arms and to the more careful and better training of the infantry soldier, in individual and mass firing, we think the distance of 1000 yds. may fairly be extended to 1300 yds. for the future.

The distance of about 1850 yds. from the main defences of an entrenched position will, then, ordinarily be the range at which artillery will come into action for definite attack; we shall therefore take it as the distance from which the projectiles are fired whose effect we propose to examine, and, unless the contrary is specified, we shall assume the ground to be level§ and the line of fire frontal.

To commence with the case of the ordinary breastwork; in Fig. 8, is shown the trajectory of a 16-pr.‖ common shell passing through the crest of the work: also the cone of dispersion¶ of a 16-pr. shrapnel burst 20 yds. short and having its trajectory somewhat raised above that of the common shell.

Bursting the shrapnel at greater or less distance than 20 yds. has the effect of increasing or reducing the section of the cone above the crest and the area of ground covered in rear of the parapet, at the same time reducing or increasing the velocity of impact of the bullets. Lowering the trajectory to that of the common shell—namely, till it passes through the crest*—the distance of burst remaining constant, increases the spread along the crest, diminishes the area of ground covered in rear and also reduces the angle of drop of the lowest bullets clearing the parapet.

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* "Characteristics of Modern Battles," translated from German by Captain Hime, R.A.

† To this there were one or two exceptions of coming into action at about 1800 yds.

‡ In the war of 1876–7 the Turkish unaimed infantry fire is stated to have had considerable effect up to 1700 yds.

§ Difference of level we need not enter into, the height of parapet being usually made to correspond.

‖ We take the 16-pr. as being the more powerful of the present English field guns.

¶ The drop of the axis of the cone we have neglected, as being of no practical importance.

If now the object of the entrenchment is to be nullified by destroying the parapet, clearly common shell must be the projectile used; and if by searching out and destroying the defenders, it is equally clear that shrapnel ought to be the projectile. The first idea may at once be set aside: for to destroy an earthen parapet to any sufficient extent with our present field service common shell (9 and 16-pr.) is impossible, the projectiles being deficient in the two essentials for such purpose—namely, penetrative power and capacity for bursting powder—† and even if replaced by still more powerful field shell,‡ the latter would yet be unequal to the task, unless a way is discovered of substituting gun-cotton, dynamite, or some such violent explosive for the present burster.

If the entrenchment is to be searched out by shrapnel, two points have to be fixed—namely, the best distance of mean burst from the crest, and the best height of the mean trajectory above it.§

There can be no question that it is preferable to burst the shell comparatively close, because the effect desired is not chiefly in depth or in height, but in width along the crest; and by short burst, the height of the trajectory being properly adjusted, the main number of bullets can be got to pass close to the crest, while, further, their striking velocity will be greater, enabling them better to work through the earth.|| The best precise point of burst, as regards spread of bullets, it would not be possible to indicate unless we knew exactly the average dispersion of the bullets in a section of the cone; nor would it be any advantage to define it precisely, seeing that our present time fuzes are not adjustable to a short difference of distance: for example, at 1850 yds. range they do not permit of less increase or decrease in length of burst than 75 yds. Other advantages of close burst are that it causes the ground in rear of the parapet to be further and better covered by bullets, so interfering with freedom of movement for supports, &c., and that it enables the point of burst to be more readily judged of, for correction in firing. We therefore consider 20 yds. short to be about the best point of mean burst, but under this we think it should not be reduced.¶

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* To lower it further than this would be unadvisable. (See after).

† We have no results of experiments on this head to refer to, but the following is given in the Prussian "Artillery Drill Regulations" for German guns:—"Tegel, 1876. Penetration into sand parapet by both light and heavy field common shell, at 437 yds. range, 39·4 ins.; crater 19·7 ins. deep, 59·0 ins. broad and 59·0 ins. high."

‡ Probably the 13-pr. under trial will give satisfactory penetration.

§ When shrapnel is burst by percussion fuze, its effect, even under favourable circumstances, is very much reduced, from the diminished velocity and angle of ascent of the bullets after graze of the shell: we therefore set it aside in the present question, as unsuited and inferior to time shrapnel.

|| A few inches of earth, however, suffice to stop shrapnel bullets.

¶ Bursting 20 yds. short gives a diameter of cone at the crest of 9·4 ft. The Prussian "Artillery Drill Regulations" recommend 27 yds. and under, as the best distance of burst.

With regard to the height of the mean trajectory, in order to obtain an increase rather than a decrease in the angle of drop of the bullets, as well as to avoid losing the greater number of the latter in the parapet, the lower half of the cone should be made use of—that is, the mean trajectory must pass above the crest and, in order that the cone may reach the latter, within a distance equal to the radius of the cone at that part. Bearing in mind what has already been said on the subject, it seems best to make a compromise between length of spread along the crest and loss in bullets and in angle of drop and to fix the height of the mean trajectory at one-fourth the diameter of the cone over the crest, as shown in Fig. 8.*

But with such—as we believe the best—application of shrapnel, can the entrenchment be considered sufficiently searched out? Certainly not; for the lowest bullet would pass over the head of a man 6 ft. high, standing in the trench—in fact, but men actually firing could be touched, and to protect these a bonnette with loopholes could readily be formed of sand-bags, &c., against which shrapnel would be powerless and which would have the further advantage of increasing the shelter in rear.†

Would, now, common shell, though not the natural projectile, so to speak, avail any better than shrapnel for searching? From the great spread of its splinters it doubtless would, providing only it could be burst about the crest, otherwise, due to the small number of fragments and their irregular dispersion, the effect would be insignificant. Would it, then, be practically possible to obtain a sufficiently regular burst about the crest to be effective, using either time or percussion fuze? We think not: for if the latter fuze was used, only shells striking within about a yard of the crest, or on the bonnette, if there was one, would be effective—in fact, the mean trajectory should pass through the crest, as in Fig. 8; all others would either be lost in the parapet, or, clearing it, would drop too much to the rear to have any immediate effect; and if time fuze was used there would be even less chance of result, for the fuze, as before mentioned, does not admit of nice adjustment to distance and therefore it might be impossible to hit off the burst within the narrow limits necessary for effect.

Against the breastwork the effective power of field projectiles therefore stands thus: shrapnel has no real searching power, not even against defenders actually firing, if the latter are protected by a bonnette, but it covers the ground at some distance to the rear well; common shell may have an imperfect searching effect, but with wasteful expenditure of ammunition; it will, however, destroy the bonnette and reduce the crest.

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* The mean trajectory thus passes 2·35 ft., approximately, above the crest, the point of burst being 7 ft. 6 ins. above the plane of the latter.

The Prussian "Artillery Drill Regulations" lay down that shrapnel should be burst 7 ft. to 10 ft. above the crest; which, for the distance of burst and angle of descent we have taken, would give the mean trajectory passing from 1 to 4 ft. above the crest.

† Increasing the range would, of course, increase the angle of descent of projectile and bullets, but such increase would not be sufficient to counterbalance consequent disadvantages—as loss of velocity, facility of observation, &c.

Such being the case, the proper method of proceeding surely is to use common shell with percussion fuze first, to prepare the way, as far as may be, for shrapnel, and then the latter with time fuze to deal with the defenders, particularly when firing and also to impede movements in rear.*

If now the line of fire be taken oblique instead of frontal, the consequence will be that the projectile becomes opposed by a greater thickness of parapet,† while its angle of descent behind the latter is practically increased. Thus, a projectile coming from the front, from a spot 1850 yds. distant and passing through the crest with 5° 5′ angle of descent, would have the latter in effect increased to 7° 10′ if, the range remaining the same, the line of fire was taken 45° oblique; and, if it passed through the parapet, it would have 9·9 ft. of thickness to penetrate instead of 7 ft. It must also be borne in mind that making the line oblique‡ and keeping the range, as before, at 1850 yds., necessitates the gun being brought to a distance of 1308 yds. from the prolongation of the breastwork—that is, possibly nearer the enemy's shooting line.§ Keeping in view the action and possible application, already mentioned, of common shell, there would not appear to be any advantage in taking an oblique line of fire when using it, but rather the contrary. With shrapnel, however, if circumstances do not necessitate too much increase of range, an oblique line will be advantageous, not only in increasing the drop of the bullets, but in keeping their spread more in the direction of the line of the parapet.

The method of attack which thus appears best suited to the breastwork will evidently be equally applicable against the field redoubt (Fig. 7), the profile of which is similar. The searching out of the redoubt, from the better cover which it affords, will naturally be more difficult, at the same time that a thicker parapet and probably more carefully prepared defences will oppose greater resistance to projectiles; hence, there will be need for longer preparation by common shell in opening the way of shrapnel. In works of this type we also expect to find large use made of overhead cover, such as blindages; against this gun-fire, as was seen in the war of 1876–7, is of no avail, and, indeed, could not be expected to be: for, in the first place, the low trajectory of projectiles fired from guns forbids, in general, their reaching such cover, and, again, even if they reached it their mining power is too insignificant for real effect.

Taking next in order shelter trenches for the infantry shooting line, and supposing them fired at under the same conditions and in the same manner as the breastwork, we have the descent of the lowest bullet which passes‖ the covering earth, as shown in Figs. 3, and 4. It will be seen that neither trench is completely searched out, for in one a man would be safe lying down and in the other secure sitting; when firing in either trench he is of course partially exposed. If, however, common shell with percussion fuze* be used, the trenches may be completely searched out, as they are shallow and the protecting earth is not of sufficient thickness to keep them out, or even many of their splinters if they burst in that earth.† In order to ensure full penetration, as well as to secure a maximum number of effective hits, the mean trajectory of the shell should strike a little above the centre of the covering earth, as shown in Figs. 3, and 4. We therefore advocate for the attack of such trenches common shell with percussion fuzes, in the first instance, then time shrapnel when the protecting earth is cut down or the infantry fully committed to firing. In using shrapnel the point of mean burst should be rather longer than when firing against a breastwork or parapet, the cover being less, as well as more easily reduced by common shell. If, however, the trench is blinded, common shell must be adhered to throughout, though it is not likely to give much result.

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* Trajectory, &c., of shell as shown in Fig. 8.

† The defenders constituting but a line, as it were, can hardly be said to be taken in greater depth.

‡ The objection that taking a target obliquely makes it of smaller width for laying on and hitting does not, of course, apply to a length of parapet.

§ If the line of fire was made 45° oblique, and frontal distance kept at 1850 yds., it would have the effect of increasing the range to 2616 yds.

‖ A few inches of earth, as before mentioned, are in general sufficient to stop a shrapnel bullet.

Against field casemates and also against open trenches for supports (Figs. 5, and 6,) the same rule will apply as to the blinded trench.

With the foregoing entrenchments, as in the case of the breastwork, an oblique line of fire with common shell is to be avoided, but with shrapnel may be advantageous.

Lastly, we come to entrenchments for artillery. In gun-pits (Figs. 1 and 2), or any form of battery for field guns, plainly the gun and gunners, while actually working must be more or less exposed, and when not working the gunners' case is similar to that of infantry behind a breastwork. To open out the embrasure, remove any protection such as logs, fascines, &c., placed across the upper part of it or upon the parapet, as well as to cut down the crest of the latter, common shell with percussion fuze, as in former instances, should first be used, thus preparing the way for time shrapnel, which should after take its place. If the entrenchment is blinded, common shell alone must be used, as with other cover of that nature. The rule already given for taking an oblique line of fire will hold good with gun-pits, &c.

We thus find as a general rule, to which there is one exception, that in the attack of field entrenchments by artillery, the object of the former must be nullified partly by destroying and partly by searching out, fire being opened with percussion common shell, and changed to time shrapnel as soon as the cover is somewhat reduced and the defenders fully committed to firing.‡ All nature of blinded cover and the deep trench for supports form the exception to the rule, percussion common shell alone being applicable against them; though, in the present state of field artillery projectiles, it can be with little promise of success.

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* Time fuze we reject for the reasons before given.

† The burst, we know, though apparently instantaneous on impact, is not really so, and therefore would usually take place towards the inner side of the covering earth; due to which, and to the onward velocity of the splinters, the main effect would be spent in the trench.

‡ Since writing this essay it has accidently come to our knowledge, that experiments have recently been made as to the searching power of Gatling guns, fired at 2500 yds. range (and therefore with considerable elevation), and apparently with good result. We however question the efficacy of such fire, under service conditions, at the long range necessary to obtain a sufficiently

We have pointed out, with regard to frontal and oblique line of fire, that with common shell the former is most advantageous, but with shrapnel, if circumstances permit of it, the latter; it remains now to make a few remarks upon enfilade and reverse fire. From the great extent of modern positions, the opportunity for such fire will seldom be presented; when it is, unless the entrenchment is well protected by traverses or parados, it must be open to be fully searched out and if so, evidently, time shrapnel is the proper projectile, and should be burst according to the ordinary rules for its use in the open. If the entrenchments are traversed, the same rules will apply as laid down for frontal fire. Even if a work is traversed, &c., there is an advantage in enfilade and reverse fire over frontal, in their greater moral effect and in their taking the defenders in a direction in which they cannot so readily reply, while, further, in the case of enfilade fire the target is taken in its greatest depth.

From what has been said on our subject, the following deductions may be made:—

For the attack of entrenchments, more particularly of hasty entrenchments in which the thickness of the covering earth is limited, the shell thrown from field guns should have as high remaining velocity as may be* at ordinary fighting ranges, so that they may be able to pass through as great a thickness of earth as possible, and deliver the bursting effect for the most part on the inner side of it.

For the attack of entrenchments of strong profile, also of field casemates and other blinded cover, in order to their sufficient searching out, pieces throwing powerful shells with high angles of descent are necessary—in other words, field howitzers.†

The limits of effective strike of percussion common shell being in all cases very restricted, it is absolutely necessary that the guns throwing them should be very accurate in their shooting,‡ and it is hardly necessary to mention that in order to utilise such accuracy to the full the gunners must be accustomed to lay upon and observe the effect of shell fired at entrenchments.§

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high angle of drop for searching—while, even if the fire was hurtful any slight over-head cover would nullify it.

It is a pity that the results of such-like instructive experiments are not made more public to the Regiment; if they were so, it would tend much to increase the desire for and the attainment of practical technical knowledge.

* This, it is hardly necessary to say, is a desideratum when firing against troops in the open, and in the later field guns has been much increased—that is, in the experimental 13-pr. and in the sometime approved foreign guns.

† Such pieces would be equally useful to the defence for searching out natural cover taken advantage of by the assailant and, also, in the close attack for sweeping the ground with large shrapnel.

‡ An additional reason for high velocity.

§ To assist their vision in laying, Nos. 1 might carry in a pocket on their belt a telescopic magnifying glass, 2 or 3 ins. in length and for use rest it against a shoulder formed on the tangent sight. A regular telescopic sight we consider unfit for ordinary purposes, though it would be useful on special occasions.

A time fuze admitting of adjustment to small difference of distance is desirable.

With reference to the desirability of high remaining velocity in projectiles, we would draw attention to the fact that our present field guns—9 and 16-pr.—are very much wanting in velocity and accuracy,* having long since been surpassed by the field guns of almost every other nation, though at the time of their introduction they were second to none. The 13-pr. now in progress bids fair to make good this deficiency in part, by replacing the 9-pr., could the equipment only be completed;† but what have we, even on the way, to take the place of the 16-pr.?

As to the introduction of field howitzers, it would be but a return to the organisation of the S.B. system, which was the outcome of long experience and would, in fact, be but amending an oversight made on the introduction of rifled ordnance consequent upon the transcendant power of rifled guns as compared to S.B.‡

II.—The Attack of Field Entrenchments as a Question of Tactics of the Unit.

In examining this question we have to determine, first, the best position into which the battery, or unit, can be brought for attack; then, what is necessary to be done previous to opening fire; and lastly, how the fire is to be conducted when opened.

We do not propose to enter into a discussion of the general requirements of the position for a battery,§ nor how particular circumstances may affect its selection, but simply to point out the *direct* conditions which, as far as possible, should be complied with in choosing a position, in order to secure maximum fire effect against an entrenchment.

We have already said that in the attack artillery ranges cannot generally be less than 1850 yds. when opposed by unsubdued artillery and 1300 yds. when by unbroken infantry. So far as circumstances admit, these limits should in the first instance be approached to, or the greater reduced, in order not only to obtain high velocity of impact, &c.,|| of the projectile, but to secure facility of laying and observation of effect. To seek to diminish the range under about 1300 yds. is, however, not required and would practically yield at such short distance but insignificant further increase of effect. When an action is opened at or about the longer limit of range, it is undoubtedly necessary, in order to final and decisive effect, when the enemy's artillery fire has been weakened, to advance to the nearer limit.

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* Other objections—as relative weight of piece and projectile—might also be urged.

† It has now been five years at least in progress.

‡ It has already been found necessary to introduce rifled howitzers for siege purposes; and the use of entrenchments on the field of battle tends to assimilate battle and siege: in fact, as at Plevna, the assailant may have to become a besieger.

§ For these, see "Minor Tactics," by Captain Hime, R.A., the R.A. Prize Essay, 1871.

|| The consequent lesser angle of descent we hold to be of no moment.

The best line of fire has also been indicated. The fact that an oblique line with common shell is not advantageous, while the contrary holds good with shrapnel, is conflicting, if both natures have to be fired from the same position; but, if such is the case, that line should be taken which, other things equal, is most suitable for the projectile mainly demanded by the circumstances of the time. It is certain that it would never be worth while to incur the disadvantages which change of position usually entail simply for the purpose of changing the line of fire from frontal to oblique for shrapnel—a projectile which has such an extended area of effect. No advantage can be got by crossing the fire of the guns of a battery, with the view of obtaining an oblique line; the degree of obliquity so obtained, even at short ranges, being insignificant, while confusion in observation of effect may be the consequence.

It is desirable that the attacking guns should have some command over the entrenchment, as observation of effect will be assisted thereby;* but too great difference of level is to be avoided, as it may have the practical effect of sensibly reducing the height of the target, which will be the more felt when the entrenchment is above the level of the guns, as then it may fall out that, due to the height of his position, the defender has not been obliged to throw up as high a parapet as ordinary.

The ground selected for the guns should, if possible, be fairly even and not too soft, to permit of their being easily worked and readily laid.

That position which affords the best combination of the foregoing conditions of range, line, and ground—special prominence being given to the first—will be the best for fire effect and should be occupied, unless wanting in some ordinary quality of an artillery position of essential importance at the time, or, in respect to those qualities, some very decided advantage renders another position, perhaps not quite so good for fire effect, very desirable. To take in quickly the circumstances of the individual case and strike a balance between advantages and disadvantages, giving due prominence to those which at the time either are, or may prove, the most telling, requires in the commanding officer of a battery an experienced eye, as well as sound and ready judgment.

The position having been selected and having been well reconnoitred by the officer commanding the battery, he should bring his battery into it, if possible, without detection by the enemy, in order, among other things, that he may secure the initiative of fire—which, besides yielding a moral as well as practical advantage, is the more necessary for him as he has to find the range, already most probably known to the enemy. In disposing the guns in the position, they should be placed to the best advantage as regards suitability of the ground for working them, possibility of covering them, &c., without reference to interval or line, providing only that their connection, as parts of the unit, under the commanding officer be not severed.

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* It also assists covering the guns.

While the battery is coming into position for action, the range to certain points of the entrenchment should be accurately taken by the range-finder, the N.C. officers appointed to use it having accompanied the officer commanding in his reconnaissance and having received definite instructions from him. If, however, a range-finder is not available, the range must be ascertained by the system of trial-shot firing,* and even if accurately measured by the range-finder, it requires to be checked by this system; because, due to variation in the quality of the ammunition, &c., the range of the projectile, however accurately the piece may be laid, may not correspond to that to which the sights are set.

The range may be considered to be obtained, or, in other words, the mean trajectory assumed to pass through the point aimed at, when half, or at short range less than half, the projectiles are "under."

Satisfied that he has obtained the range, the officer commanding has then to regulate the distribution, or otherwise, of fire, adhering to the conditions regarding projectile, &c., laid down in Part I.

Concentration of fire is, we know, necessary to decisive effect; supposing, therefore, that gun-pits form the target, the whole fire of the battery should be directed successively upon each pit until the gun in it has been silenced and the pit ruined. This mode of proceeding is further necessary as, due to the relative lie of the entrenchment and the battery, the range may not be the same to each pit, and it would be very inconvenient at the least, to take up several ranges at the same moment. If a line of infantry in shelter trenches, &c., is the object, not being so formidable for reduction as the preceding, the same amount of concentration is not required; therefore, instead of the fire being confined, as it were, to points, it may be extended to lengths in succession. The particular length taken by a battery should, we think, about equal its front,† or in round numbers about 100 yds.; this must, however, be partly dependent upon the total length of the entrenchment, as it should be equally covered by the guns, without—if we may so describe it—leaving a fractional part for the fire of all the guns to be finally overcrowded upon, or for some guns only to deal with.

The fire of the battery should be carried on regularly and deliberately from flank to flank; hurried fire, with hasty and imperfect observation, can never be effective and independent firing is, in our opinion, to be deprecated, unless very special circumstances call for it, as it removes the power of proper supervision and ordering from the commanding officer and tends to permit undue haste.

When the fire of a battery is changed, while in the same position, from percussion common shell to time shrapnel, the correct distance of mean burst of the latter has to be obtained and can most readily be found from the known range, as basis, by trial shell.* At the same time, as we have seen, in all cases the mean trajectory should be raised slightly above that of the common shell—an alteration which should be effected by means of the sights.

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* See "Manual of Siege and Garrison Artillery," 1879, p. 32. In this trial firing each gun should be laid on the same point—such as the crest of the parapet at one flank, or a flank embrasure, to which the range has been taken, as named by C.O.; each No. 1, checked by his divisional officer, giving the particular deflection required by his own gun.

† The Nos. 1, trained to this length, on the command "Distribute the fire," would readily take up that point of the object distant the proper space for his gun from the point to which the range was taken, and on which probably the flank gun would continue its fire.

When it is desired, as it may be from a near position, to employ time shrapnel at once on coming into action, we would still advocate ascertaining the range correctly with the assistance of percussion common shell, and proceeding as above, because of the great difficulty of otherwise hitting off the correct range, height of trajectory, and distance of burst at once, due to the difficulty of accurately judging the point of burst of time shrapnel; while the power of the shell being restricted by the cover, there is the more need for its being burst at the most suitable point.

In carrying out the foregoing programme of firing, after taking up position for action, the effect will, in the main, depend upon the ready and correct use of the range-finder in the first instance, then upon the commanding officer's correctness of judgment and observation and finally upon the divisional officers and Nos. 1 carrying out his orders strictly and with intelligence.

We have already, in Part I., adverted to the necessity for these latter being practised in firing at entrenchments, in view of accurate shooting on service; we would now further advocate the same on the ground that they might be able, from their own individual technical knowledge, fully to grasp and hence, without doubt or hesitation, carry out their orders. And even much beyond this we would go, and insist upon the practical training of the commanding officer in such firing; that he, upon whom so much depends, might be fully equal to the occasion. Of late years much has been done in the right direction in providing land ranges for some of the field artillery annual practice; but, we believe, there is still too much adherence to the time-honored 6′ × 6′ target,† and too little approach in dummies‡ placed in entrenchments (also behind natural cover and in the open) to service conditions, while the officer commanding the battery never has the opportunity of applying and ordering the fire of his battery, as he would have to do on service. As part of the annual practice of a battery, it should be brought into action against dummy guns and gunners in gun-pits,* dummy infantry, lying down, firing, &c., in trenches and behind breastworks,§ at unknown ranges, without any communication with a range-party and fire a certain number of rounds of each kind of shell, when the result should be carefully examined and noted by an umpire.||

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* See "Manual of Siege and Garrison Artillery," 1879, p. 31.

† Such is, of course, necessary for first training.

‡ Dummies should always be painted the correct colours; not white, or left plain, which renders them more conspicuous than true.

§ Also dummies behind natural cover and in the open.

|| The results of this firing of the different batteries—taken, as far as possible, by the same umpire—should be tabulated and published in regimental orders. The figures would represent the *bonâ fide* value of the batteries in one of the highest qualities necessary for service.

We feel certain that the smallness of the result, in nine cases out of ten, would be astonishing; for perfection of fire is not to be learnt by intuition in any number of years of ordinary routine, as the French found to their cost in the war of 1870-1. Autumn manœuvres—very necessary for many reasons—cannot assist in acquiring shooting power; for this we can alone look to careful preparation in the battery drill-field and then to the annual practice, but to make the latter answer its proper end in this respect the present system requires remodelling.*

But to pass to other points, admitting that the present range-finder is all that can be desired (which, however, we are much inclined to doubt), it requires, for its ready and correct use, men who have been carefully instructed to use it and, not only so, but kept constantly habituated to its use. Now, what provision is made for this? Simply none at all; the range-finder is handed over to some one or two junior N.C. officers of the battery who have used it once or twice during a course of gunnery instruction at Shoeburyness and no horses are allowed for the purpose of mounting them.† There can be no question but that obtaining the range quickly and accurately is of the greatest importance, for every shot fired until this is done is so much ammunition thrown more or less away; hence provision should be made for the effectual use of the range-finder, in which view we would suggest that in each battery two selected N.C. officers should be trained for the purpose, distinguished by a badge, and horses provided to mount them.

Accurate observation, especially on the part of the officer commanding the battery, preparatory to and during firing we have seen to be very necessary; but this cannot be attained without the aid of a good field-glass. For service, every officer is recommended, or supposed, to provide himself with one; but in peace—which should be preparation for war—nothing is laid down on the subject. We think such a necessary article ought not to be left optional, and we suggest that the present pouch of artillery officers might well be replaced by a case carrying a small and powerful glass.‡

Range cards (waterproofed) giving lengths of fuze, &c., should be provided for all officers, that they, and especially the commanding officer, may have ready to hand the information they may require, without having to go to the range plate on the carriage for it.

It is very desirable that the probable rectangles of field pieces at ordinary ranges should be published, that officers might know what their guns could do, and therefore what they should do, in point of accuracy in the hands of their men; but as it is at present they have no standard with which to compare. Again, if it is desired to raise the point of incidence of the trajectory of a projectile a certain vertical height on a target, there is no table to show how much to alter the tangent-sight. Surely the "Manual of Field Artillery Exercises" should contain these and all necessary tables of reference, and not only so, but all technical information tending to instruct the artillery officer in the scientific use of his weapon and the proper tactical application of his arm; but, as it now stands, the book consists of little more than details of drill, which, though necessary for training, are but the first stage towards effect on service.

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* The system, that is, as carried on at standing camps. With regard to annual practice of field artillery over sea ranges (to which half, or even more than half, the horse and field batteries at home are condemned), we can only say that it is an absurdity, being a waste of ammunition, except so far as to decide the prizes for skill at arms, or teach the preliminaries of gunnery to unskilled men.

† Two spare riding horses only are allowed to each battery; but these are to cover casualties, and if not so employed are taken up by the Rough Rider and 2nd Trumpeter.

‡ For war, the ordinary pouch-belt—or, as it then would be, the field-glass belt—might be replaced by one doubled and stitched to receive revolver ammunition.

III.—THE ATTACK OF FIELD ENTRENCHMENTS AS A QUESTION OF TACTICS OF THE MASS.

In treating of the attack of an entrenched position—as, in other words, our heading might be stated—we shall assume, in order to fix our ideas, that the attacking force is an army corps and that, the enemy's advanced posts having been driven in, he is "contained" within his position.

From the range and power of its projectiles, artillery must ever prepare the way for the advance and assault of the infantry. Hence the arm has, in the first instance, to subdue, and if it may be silence altogether, the artillery of the defence, covering at the same time the deployment of the infantry; then, to destroy the defences and artificial obstacles of those spots selected for assault and to disorganise the infantry defenders.

The officer commanding the artillery, having accompanied the General in his reconnaissance and having been made acquainted with the points of attack and general dispositions, communicates any particular information he thinks necessary to give to the commanders of the divisional and corps artillery. The latter commander remains with him and receives his orders direct from him, while the former receive their orders each from the General commanding his division, whom he accompanies in reconnoitring the attack appointed to the division, and with whom he determines the position which the divisional artillery is to take up.

In selecting this position a few general conditions, over and above those already mentioned when speaking of the unit, have to be kept in view—namely, as follows: the artillery should be so placed that its fire may not be likely to be masked by the infantry advancing; the arm should be in tactical connection with the latter, yielding to it not only the necessary physical but moral support; its units, separated if need be, in order to take full advantage of ground, line, &c., should not be so dispersed as to sever their union under the divisional commander. The first of these conditions points to placing the artillery on the flank* of the ground on which the infantry will deploy, as well as to the position having command over the entrenchments, which latter, as already stated, is to be desired for other reasons; the second, to the necessity for change of position from that first taken up to one at short range, a condition already mentioned as necessary for decisive effect—on occasions, to within even less than 1300 yds. of the entrenchments, for full moral support.

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* And slightly in advance, to cover the deployment.

The position for the divisional artillery having been thus determined, officers commanding batteries receive their instructions from their divisional commander, as fully as may be, not only as to position, attack, &c., but as to the ends in view. In general the batteries should not be brought into the position sooner than necessary for opening fire at the time ordered, but should remain near wherever they can best be covered and any time available employed in preparing the position by digging gun-pits, &c., if it can be done without attracting the enemy's attention.

In telling off the batteries to their respective posts in the position, the light battery should be placed upon the more exposed flank, so that, if required,* it could change front to resist a flank attack while the heavy batteries continued their fire against the entrenchment. This battery should also, if possible, have a weaker, or a less extensive part of the entrenchment than either of the latter apportioned to it as its object of fire. In appointing the latter the divisional artillery commander must regulate the concentration of fire as he thinks advisable, but each battery should have its own individual object, or part of the entrenchment, to prevent confusion in observation of effect and consequent difficulty in obtaining accurate fire; the amount of concentration being arranged by the degree of closeness of the separate objects or portions.

The batteries of the division should open fire simultaneously, in order to secure superiority of fire; and having opened fire, the ordering of it should remain in the hands of their respective commanding officers, until a change of object, or position, is ordered.

We may here note that, as in the case of the divisions or half-batteries of a single battery, no advantage is gained by crossing the fire of a division in line against an entrenchment in the view of obtaining an oblique line, though, of course, the obliquity obtainable will be greater than in the case of the single battery.

From the successful manner of employment of the German artillery in the war of 1870–1, it has come to be generally accepted that "the entire artillery of the main body ought to be brought up at the very commencement of an attack and all the guns brought into action at once;" the object assigned for this procedure being to prevent the enemy destroying the attacking artillery in detail as it comes up and also, by numbers and concentration of fire, to obtain superiority of fire as early as possible.

We agree with the desirability of the latter and that all proper endeavour should be made to attain it, but we cannot admit that the above is the correct manner to secure it, for the following reasons, namely:—Forming up a comparatively large mass of artillery from column of route takes time and extends over considerable ground, hence, the main body of the infantry being to the rear, the mass can be but inadequately protected and therefore offers an opportunity* for striking a severe blow which an energetic defender is not likely to let slip;† it is hazardous not to retain some artillery in hand to meet critical and unforeseen circumstances, and even though it may be possible to withdraw a part from action for a pressing new application, yet it may be a matter of some difficulty and must certainly be so of time more or less—which is usually an element of all importance—while the aid thus brought cannot be so effectual as that of fresher troops; it may, from the extent of its continuous line, delay unduly the deployment of the infantry and cause them to have greater distance to traverse, not only previous to deployment, but in their after advance, and also in the latter to mask quickly some of the guns; it facilitates, in the massing which it entails, the concentration of fire and consequent effect of the artillery of the defence; it will not, in general, permit of the guns taking advantage of the ground most suitable for them as positions; it is exposing the whole of the General Commanding's hand, tying him down to a certain line of action and using the arms of the service abnormally in applying them independently instead of in combination; it is not necessary in order to prevent the enemy destroying in detail the artillery of the attack as it comes up, because the first position for the latter is so chosen as to be, as far as possible, beyond that range at which it is likely to suffer serious loss in this manner, while natural cover will probably be available and, if not, artificial may be thrown up, while, further, in the attack of an entrenched position, as already mentioned, guns should not be thrown forward till required to open fire and fire should be opened simultaneously and not independently; nor is it necessary in order to concentration of fire, for this can usually be better obtained without concentration of guns, adapting the position of each battery, or division, to the particular object, or objects, of fire appointed it.

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* Part of the reserve would, in general, ward off such flank attack.

We would therefore advocate the divisional artillery of the attacking divisions coming into action, to fulfil their *rôle*, locally with their divisions; then the corps artillery and the artillery of the division in reserve, supplementing them against the most decisive point, or points,—which become more evident as the engagement proceeds—and also acting as reserve proper.

The corps artillery of a British army corps is laid down to consist of two 16-pr. field batteries and three 9-pr. horse artillery batteries, and the artillery of a division of two 16-pr. and one 9-pr. field battery. It is clear that of these the lighter and more mobile batteries are the more proper ones for discharging the chief duty of true reserve—namely, making flank attacks, which may necessitate long detours, manœuvring to resist counter attacks or to meet the necessities of critical moments. Again, it is generally allowed that the divisional artillery should form an intimate part of the division to which it belongs and act with it; hence it follows, taking the batteries as above, that the three horse artillery batteries would best form the reserve artillery proper and forming it should be attached for the time to the division in reserve, the heavy batteries of which would be better attached to, and utilised with, the corps artillery against the decisive points of the entrenched position.

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* This is the more apparent when we consider that with modern arms it takes but a short time in the close fight to decide the question of success or reverse.

† See on this subject R.A. Prize Essay, 1876, by Colonel Smyth, R.A.

As soon as the artillery of the defence has become somewhat subdued, and the infantry of the attack sufficiently advanced, the batteries must be moved forward to their second* position. This should be by successive batteries, those being first pushed forward whose fire has become of less consequence, or of less efficacy, in the original position. Endeavour ought, however, to be made to throw forward some of the heavy batteries early, not only because of their greater power against infantry, but to subdue guns of the defence hitherto unsubdued—perhaps undiscovered—which might seriously impede the further advance of the infantry.

From the first position of attack the fire of the batteries against the entrenchment will mainly consist of common shell; but from the second, the defences being partly reduced and the infantry defenders continuously firing, will be the opportunity for shrapnel and for taking an oblique line of fire—the latter not only increasing the fire effect of that projectile, but suiting the placing the guns on the flanks of the advancing infantry, so that they may not be masked by it.

Immediately preceding the assault, the fire of the batteries should be as quick as it can effectively be, and as soon as it becomes masked by the infantry it should be turned upon the enemy's reserves, or, if need be, to repulse any counter-attack.

Should the assault be successful and the entrenchment occupied, some guns of the reserve should be advanced into it, in order to securing it.

We need hardly mention that it is essential that a perfect supply of ammunition be kept up to the gun-limbers during the action.

In conclusion, we would make a few observations. First, with regard to the proportion of horse artillery. Three batteries are allowed to the corps artillery, which, as we have already stated, would naturally be employed in flank attacks, resisting counter-attacks and supplying aid at critical moments; in all which purposes time comes in as an element of the greatest importance, and hence speed may be required, while the distance to be traversed may be comparatively long. Notwithstanding such conditions, we are of opinion that horse artillery is not, in general, required for these duties, but that light field batteries are sufficient; because the latter are more mobile than infantry, though not so much so as cavalry and because further, it is neither necessary nor desirable now, in the days of rifled arms, to approach to such close range of the enemy as formerly in the time of smooth-bore arms. Two exceptions, however, must be made in favour of the employment of horse artillery—namely, when the batteries have to act in concert with cavalry and when they have to act independently with the utmost speed, as, for instance, when bearing aid at critical moments. For the former—which is the true purpose of horse artillery—there is the horse battery of the cavalry brigade and for the latter—which would be of rare occurrence—one horse battery in the corps artillery would suffice; we therefore conclude that two horse artillery batteries of the corps artillery might well be replaced by two light field batteries.* In this we are assuming that, as at present, both horse and light field battery are armed with the same gun, the propriety of which cannot be doubted; for, apart from other considerations, the additional weight of 5 cwt., due to the three extra men mounted on the carriage, brings up the weight behind the team of the light field battery to quite as much as is admissible.

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* More than one change of position may, of course, be necessary.

In Part I. we have shown the necessity for the introduction of field howitzers for the attack of entrenchments. Such pieces should be disposed in batteries, not as they were in the S.B. system mixed with guns in the same battery, which tended to complication and confusion, besides preventing the use of the full power and proper application of both descriptions of ordnance at the same time—one being, as it were, tied down by the other. It appears to us that it would be well if the two 16-pr. batteries of the corps artillery were replaced by heavy field howitzer batteries,† for special use against the decisive points of attack.‡

As in Part II. we adverted to the need for systematic and practical annual practice in order to effectual training of field artillery, so now we would lay stress upon the absolute necessity for autumn manœuvres, or combined exercises on not too small a scale, in the same view. Without such regularly—not incidentally, once in a way—how can officers commanding divisional artillery, or batteries, be habituated each to perform his own proper part in the chain of responsibility towards a common end, and more especially in taking up proper positions, with reference not only to fire effect but to combined action with other arms? Proper and ready choice of position is, as we have already stated, difficult; not so much in satisfying the ordinary desiderata in detail of ground, as in proper adjustment to circumstances of the moment. Hence nothing but practice in dealing with circumstances as they arise can give the power and confidence necessary in order to right selection.

In conclusion we would note that the terms "reserve" artillery and "massing" guns seem now frequently used in an uncertain sense and it appears desirable that definite meanings should be attached to them. For example, the former term is frequently applied to the corps

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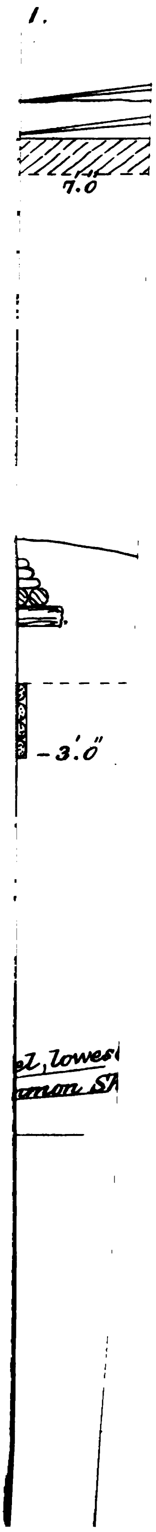
* And for all field service, not merely the attack of an entrenched position.

† The construction of this equipment would be guided by the consideration that the total weight behind the team should be the same as the heavy field batteries—*i.e.*, the maximum admissible for field service. A light field howitzer we consider unnecessary.

‡ They would be equally useful for defence, to search out artificial cover, hollow ground, &c., as already mentioned.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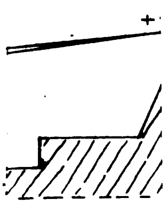

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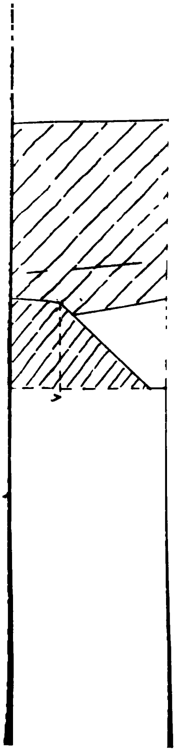

artillery, which, as a whole at least, is not likely to be placed in reserve and used as reserve proper, to which alone the term is applicable. Similarly, the term "massing" guns is applied to concentration of guns, and may or may not be intended to include concentration of fire—sometimes it is even applied to the latter without including the former; it would be better, we think, though its object is usually, more or less, concentration of fire, to restrict it to the simple meaning of the word—concentration of guns—leaving such further explanation as the occasion might require to be added.

SHEFFIELD,
March, 1880.